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ABSTRACT

Sixty videotaped lessons from six fourth-grade classes were used to examine, first, to what extent instructional processes differ from each other in relation to other properties of the teaching process during lessons belonging to varying activity forms or content types; and, secondly, to what extent differences within the instructional process are connected with teacher variables. It was found that the use of many-sided activity forms in a class positively relate with cohesion of the process, but negatively relate to abstract and authority-bounded content. It was also found that many-sided use of activity forms and cohesion in the process were rather closely connected with teacher characteristics supposedly indicating inability or unwillingness to understand pupils and with individualistic views of educational goals. Results support rather than contradict the belief that the way instruction is carried out is of greater importance than content of the instruction. They also support the hypothesis that there is a connection between certain personality traits of the teacher and instructional interaction. (Author/MJB)

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Matti Koskenniemi

STRUCTURAL ELEMENTS OF THE INSTRUCTIONAL PROCESS: ACTIVITY FORMS AND CONTENT
DPA HELSINKI INVESTIGATIONS I

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Preface

What factors exert influence when instructional processes take shape? This problem has troubled my mind for nearly forty years. In several textbooks I have presented some ideas on the dynamics in structuralization of instruction. These have, however, been based on unsystematic experience and also on speculation.

Now, much later, material collected within the DPA Helsinki project, provides an opportunity to test some of my early hypotheses about structural elements in the instructional process. So much many-sided information about a number of lessons is stored in the DPA Helsinki Data Bank that such an enterprise has been possible.

Without the joint effort of the DPA Helsinki research team at collecting and analysing that material this paper could not have been written, and my sincerest thanks go this team. I am especially indebted to Ass. Prof. Erkki Komulainen and Dr. Kari Uusikylä for their help in classifying material regarding teacher personality and the relevance of instructional contents. Last but not least I thankfully remember our participating classes, their teachers and pupils, who allowed us to look into the ways of their interaction.

Institute of Education,
University of Helsinki,
December 1977

Matti Koskenniemi

STRUCTURAL ELEMENTS OF THE INSTRUCTIONAL PROCESS: ACTIVITY FORMS AND CONTENT

1. Introduction

This paper deals with a problem included in the didactical investigations of the OPA Helsinki research team (KOSKENNIEMI & KOMULAINEN 1974; 1976; 1977). By using a system for describing instructional processes (KOSKENNIEMI & al. 1974) this team has described continuous and holistic chains of instructional situations consisting of preinteractive, interactive and postinteractive phases. Further, the OPA Helsinki team has searched for invariances both within instructional periods (lessons) and between periods following each other and tried to understand and explain instructional processes in terms of persons participating in the interaction and on the basis of certain groups of frame variables, such as teacher and pupil characteristics, social structure, and goals.

In the absence of a comprehensive theory concerning instructional processes which would allow construction of a research model to be tested empirically, the OPA Helsinki project was based on the following definition. Instruction is a chain of interactions, situated in the life cycle of the school, and aimed at the development of pupils' personalities in the directions determined by educational goals.

The OPA Helsinki System consists of eight aspects which are related to or derived from the above definition in the following way.

The instructional process conceived of as goal-related interaction comprises three basic properties.
Firstly,
an organized structure with certain roles, which in the DPA Helsinki System is represented by aspect A: division of labor and responsibility, and grouping of pupils; description of this aspect is operationalized by forms of instructional activities and their sequence.
Secondly,
an immediate goal, i.e., the matter to be learned, represented by aspect C: content according to the system of knowledge and skills, and its relevance for pupils.
Thirdly,
cognitive path and level of the learning process, represented by aspect B: formal characteristics of verbal communication.

These three aspects are quite traditional and to be found in almost all prescriptive textbooks of teaching. In our system they are, however, operationalized in such a way as to make empirical description possible.

Two further aspects included in the DPA Helsinki System also appear in traditional, speculative didactics: participation of pupils and goal-relatedness of instruction. These aspects serve to uncover additional meanings in organization of the instructional process by way of information about participants' relations to the organization as such or to the direction of activities: acceptance of roles, represented by aspect G: pupils' participation; and
acceptance of agreed or given goals, represented by aspect H: goal-related behavior.

The following two aspects give information about personal relations within the process:
quality of interpersonal relationships, represented by aspect D: emotional climate of the classroom; and
function of individuals in the community as regards given or voluntarily assumed tasks; aspect E: authority relationships.

Finally, the DPA Helsinki System includes aspect F: flexibility. Within this aspect the behavior of the teacher is described in terms of a continuum from flexible to rigid and conventional.

Properties of the instructional process, described by means of aspects A to H are not necessarily covariant. They represent different sides or levels of that process. The cluster of the following properties is an exception: positive emotional climate (D), indirect teacher influence (E), pupil participation, also independent of the teacher (G), and awareness and consideration of instructional goals on the part of the pupils (H). These properties go more or less hand in hand, as practical experience and many empirical findings have shown, and they also presuppose each other theoretically. The cluster of these properties is here defined as cohesion. In a strongly cohesive process actors are bound together in the personal area as well as in practical undertakings.

The concept of cohesion is, however, as can easily be seen, not value-free. It is based on the assumption that instructional interaction which can be classified as cohesive is in harmony with democratic goals of education, and an effective means of reaching them.

How the four elements of cohesion are operationalized in terms of our taxonomy and how they covary in practice is described in Appendix 1. The results seem to justify the use of cohesion as a higher-level variable.

2. Design

In the analysis of the structure of didactical interaction various aspects of the instructional process can be compared with one another. It is preferable to base such comparisons either on aspect A (organization of the process in general, described by activity forms) or on aspect C

(matters to be learned and their relevance for pupils). As these aspects include planning of and decisions about instruction they offer concrete starting points, whereas other aspects (e.g., B: formal characteristics of verbal interaction, or D: emotional climate of the classroom) are not so suitable as points of departure.

In teacher education the content of instruction has traditionally been used as a structural element in guiding student teachers, partly because most curricula are built up according to content. Activity forms have seldom been used for this purpose, and in student teaching primacy of subject matter over activity forms seems to be the rule. From the point of view of didactical theory it is, however, interesting to compare lessons classified according to both aspects.

3. Material

In the present study the DPA Helsinki main material was used (KOSKENNIEMI & KOMULAINEN 1976). This material was collected in the spring term of 1975 in six 4th grade classes working in urban and suburban environments. Teachers and pupils had already started exercises in joint planning during the 3rd school year, and the material of this study consists of videotapes representing the major part of one jointly planned school week in each of the classes (a total of 60 lessons).[1] These records have been supplemented with direct observations, tests and questionnaires. All lessons are described and analysed according to the DPA Helsinki System. In addition certain frame variables are available, e.g., data concerning teachers, pupils' homes and individual traits, class structure, educational goals, curricula and learning materials.

[1] From the total number of videotaped lessons (84) joint planning sessions and some lessons with non-observable interaction (writing etc.) are excluded.

As has already been mentioned, activity forms and content of instruction are points of departure for this paper. Classification procedures of these two aspects are therefore described in detail. As regards other process variables the reader is referred to the DPA Helsinki Manual.

Organization of instructional interaction, which includes division of labor and responsibility, and grouping of pupils, is operationalized as activity forms. Activity forms are primarily classified as teacher-centered, pupil-centered and cooperative depending on whether the teacher, the pupils or both take the initiative and are responsible for progress in the classroom. Subcategories are based on the size of pupil groups and on occurrence of division of labor and/or roles in these groups. - Activity forms were classified as follows:

Teacher-centered (TC)

- Teacher presentation (TC_1)
- Teacher questioning (TC_2)
- Joint exercises (TC_3)

Pupil-centered (PC)

- Individual work (PC_1)
- Performance of individuals or groups (PC_2)
- Group work (PC_3)

Cooperative (CO)

- Instructional discussion (CO_1)
- Assembly (CO_2)

Frequencies of the two last-mentioned categories were so small in the material that they are overlooked in this paper. As to CO_1 its share would be grater if all weekly lessons were considered, because planning sessions were in some classes carried out in the form of discussion.

Activity forms were recorded in order of occurrence with an accuracy of five minutes. Characteristically, a simple chain of activity forms during a lesson was described as follows (upper indices stand for duration):

$$TC_1^5 - TC_2^{10} - PC_1^{25} - TC_2^5$$

Such a line of codes can be condensed to frequency distribu-

tion of main categories of activity forms, e.g., TC 56% - PC 44% - CO 0%. Recording of the one activity form which dominated during the lesson seems, however, to be most relevant to the use of activity forms. The lessons were classified according to the most predominant activity form as seen in Table 1.

Table 1. Distribution of Lesson Types According to Dominating Activity Form

Type code	Dominating activity form	Class[1] 300	600	500	400	200	800	Total	%
T1	teacher presentation	1	1	-	-	-	-	4	7
T2	teacher questioning	4	7	3	2	-	2	18	30
T3	joint exercises	3	4	4	8	5	1	25	41
P1	individual work	-	-	1	-	-	1	2	3
P2	performances of individuals/groups	-	1	-	1	4	4	10	17
P3	group work	-	-	-	-	1	-	1	2

[1] Listing order of classes illustrates to what extent the use of activity form characterizes many-sidedness and avoidance of teacher-centeredness.

As is evident from the table lesson types are not evenly distributed among classes. In addition, types P1 and P3 are disregarded in the subsequent analyses owing to their small frequencies.

Besides the dominating activity form other forms appear during the lesson in most cases. Usually these activity forms belong to the same main category (TC or PC). All three main categories were represented only in five cases, and in 38 cases only one of the main categories appeared. Many-sided use of activity forms was recorded in three of our six classes, viz. 400, 200 and 800.

Content of the lesson was classified according to a classification adopted from a committee report on the curriculum for the Finnish comprehensive school (1970):

Subject matter planned for mastering means of communication (MC)
Subject matter planned to increase knowledge of environment and reality in general (KR)
Subject matter for adopting formal systems (FS)
Subject matter which promotes adoption of value systems (VS)
Subject matter promoting acquirement of motor skills (MS)

Categories of content are related to official subjects as follows. - MC appears in the Mother tongue (Finnish) only, likewise FS only in Mathematics; KR content has been recorded during lessons of Environmental & Social studies, Geography and Biology, and Religion; VS content has been recorded both in the Mother tongue and Religion. The few cases of MS (Drawing) have been disregarded in analyses.

Every lesson has been classified in relation to the main category of content. Distribution of content categories is reported in Table 2 below.

Table 2. Distribution of Lesson Types According to Content

Type code	Main content	Class 300	600	500	400	200	800	Total	%
MC	means of communication	2	3	1	2	2	3	13	23
KR	knowledge of reality	5	3	3	6	5	5	27	45
FS	formal systems	-	4	2	2	2	-	10	17
VS	value systems	1	1	2	1	1	2	8	13
MS	motor skills	-	2	-	-	-	-	2	3

As was the case with activity forms, distribution was not even among classes. This is due to the fact that, although the schedule of subjects was the same in all cases, teachers could to some extent influence the selection of lessons to be recorded during the jointly planned week.

Contents have also been rated as to relevance for pupils (scale 0 to 2). As to novelty, contents which, on amount of previous experience in the school or outside, were familiar to most of the pupils have been scored lowest, quite new contents highest. Attractiveness of the content has been rated in a similar way. Distribution of ratings for novelty and attractiveness is given in Table 3.

Table 3. Relevance of Contents for the Pupils

Contents of the lesson	Novelty of content			Attractiveness of content		
	0	1	2	0	1	2
MC	5	3	5	1	5	7
KR	3	17	7	1	17	9
FS	5	2	3	-	10	-
VS	1	6	1	-	4	4
MS	-	-	2	-	2	-
Total	14	28	18	2	38	20

On the whole, distribution of novelty ratings is almost normal with the exception of FS lessons among which familiar topics are in majority. As regards attractiveness dispersion is small and skew. Moreover, there are great differences between content areas, and FS lessons do not differ from each other at all.

Information about other process variables as well as about certain frame variables will be given after next section where the problems are presented.

4. Problems

Use of activity forms and their combinations varies from one lesson to another in the same classroom. Inter-class differences are also considerable. In order to find out possible connections between use of activity forms and other properties of the instructional process, lesson types according to dominating forms were constructed (Table 1).

Such a classification is, however, a rather inadequate solution. Information is also needed about the sequence of activity forms, because this, not the frequency alone, is essentially the structural frame of didactical interaction. This sequency also reflects intentions regarding division of labor and responsibility (i.e., roles) of persons who are planning the lesson, regardless of whether these ideas are more or less conscious or not. The decision to adopt an activity form or a sequence of such forms is influenced not only by the content to be learned but also by a number of frame factors, such as teacher characteristics and goals, pupil traits and behaviors.

Such factors are reflected in choice of the dominating activity form which has the greatest influence on the organizational frame of didactical interaction. But the activity forms with which a lesson begins or ends are also of importance. FLANDERS' investigations (1963) support the notion that especially the former plays a significant role in the process.

Lessons included in our material begin with every possible activity form from TC_1 to CO_1. It has not, however, been possible to classify sequences according to their beginning in a satisfactory way. More material is needed for such an analysis. In our case lessons beginning with an activity form not belonging to the same main category as the dominating form numbered only 17 out of a total of 60.

The use of activity forms during a lesson apparently has connections with the learning goals. Properties of the matter to be learned (its novelty to pupils, expected diffi-

culties in learning it, its potential attractiveness) may favor certain activity forms at the cost of others.

The impact of content and its relevance to the use of activity forms are, however, probably not decisive. Teachers have successfully practised different combinations of activity forms in nearly similar situations, and their pupils have been used to such practices. The same ends can be reached in the most different ways.

But if properties of the instructional process are dependent on the activity forms mainly used, two questions arise. First, are there concomitant properties within other areas of the process which are connected with some typical activity forms, and second, are activity forms - as easily planned properties of the instruction - connected with some frame factors.

According to the DPA Helsinki investigations most teachers take activity forms into account when planning instruction. It has also been found that during joint planning even pupils are able and ready to discuss different solutions in this respect. Use of activity forms, as has already been stated, varies considerably from one classroom to another even if contents are similar. These facts give additional meaning to the two questions presented above.

They are of importance also in regard to the total influence of instruction. KILPATRICK has long ago, when presenting his views on concomitant learning, wisely stated that all these processes should be planned together (1926, 6-9). From that point of view, the purpose of this paper is, to find out any discernible connections, on the one hand, between the use of activity forms and contents of instruction, and on the other hand, other aspects of the instructional process (which can not be planned in advance as easily as activity forms and contents). The comprehensive data bank collected by DPA Helsinki team also makes it possible to try to uncover connections between the use of activity forms and certain frame variables, especially characteristics of the teacher.

The manner of operationalizing the use of activity forms as well as the contents of instruction has already been presented. Other process variables which have been used are listed below (for details, cf. the DPA Helsinki Manual, KOSKENNIEMI & al. 1974). When these two groups are correlated to each other, it should be kept in mind that some inter-process relationships are technical and cannot give any new information. It is, for instance, apparent that the share of teacher moves out of all moves during a lesson (index B12) will always be high when teacher-centered activity forms are dominating. In such cases the share of pupil-pupil sequences of all sequences (index C2) necessarily remains low.

Process variables used in this study are:

- Share of teacher moves out of the total number of moves (B12)
- Logical level of moves (B23)
- Content-centeredness of the teacher (B24)
- Share of indirect teacher influence (E1)
- Flexibility of the teacher (F)
- Share of teacher moves with social-affective properties out of the total number of teacher moves (D2)
- Share of positive teacher moves out of the total number of teacher moves with social-affective properties (D3)
- Spontaneity of pupils (B13)
- Goal-related behavior of pupils (H1)
- Share of pupil-pupil sequences of all sequences (C2)

Content-centeredness of pupils (B24)

- Share of personal experience in pupils' communication (B22)
- Share of pupil moves with social-affective properties out of the total number of pupil moves (D2)
- Share of positive pupil moves out of the total number of pupil moves with social-affective properties (D3)
- Tension release (D6)

The following frame variables are used:

Teacher characteristics

- Psychometric data
  - -- Attitudes (Teacher Preference Schedule, TPS A, STERN)
  - -- Gratification (Teacher Preference Schedule, TPS G, STERN)

  also factor scores
  - -- Needs (Personal Preference Schedule, EPPS, EDWARDS)
  - -- Traits (10 PF, HÄYRYNEN)
- Interviews regarding the planning of instruction

Learning materials

- Textbooks, exercise books

5. Expectations

As to relationships between aspects A and C, on the one hand, and other aspects of the instructional process, on the other hand, it is expected

1° that many-sided use of activity forms in a class, expressed by aspect A, correlates with high scores of cohesion;

2° that many-sided use of activity forms during a lesson correlates negatively with predominance of abstract and authority-bounded content of instruction, as expressed by aspect C; and

3° that many-sided use of activity forms in a class correlates with high scores of teacher's flexibility (aspect F).

In regard to relationships with frame variables, it is expected

4° that one-sided use of activity forms in a class and low scores of cohesion correlate with teacher's inability or unwillingness to understand pupils as individuals and groups, as well as with difficulties in shaping didactical interaction during planning.[1]

[1] Cf. KOSKENNIEMI & al. 1965, 547.

6. Results

6.1. General Considerations

This study which concerns only six classes and sixty lessons is clearly of "action research" type. Therefore, empirical data should not be used as in experimental studies. Our data, collected from participating classes which retained their natural way of living, are not representative from a general point of view (cf. Tables 1 to 3), but the classes have so many features in common (pupils of the same age, nearly the same curricular contents, joint planning) that the combining of classified data for comparison is justified. A strict ceteris paribus requirement is not, of course, fulfilled in such a case. Therefore, and also because of the small numbers, a rigid scheme of statistical inference has not been applied and, e.g., significance values have been disregarded. Conclusions are based on general trends in data which in their manifoldness control each other.

Qualitative and quantitative data have been used jointly especially when connections between frame and process variables are studied. A hermeneutic approach has been applied, e.g., several variable groups are kept together in order to find meaningful explanations, i.e., the process and its frames are looked upon as a whole.

6.2. Inter-class Differences in Instructional Processes

Before the special problems of this study are analysed data of process variables in participating classes are presented (Table 4).

Table 4. Instructional Processes in the Six Classes Characterized by Some DPA Helsinki Indices

Index and its code in the DPA Helsinki Manual	Class 300	600	500	400	200	800	Distribution at large Q_1	Md	Q_3
Share of T moves out of total number of moves (B12)	.61	.64	.56	.52	.55	.48	.53	.59	.62
Logical level of moves (B23)	.02	.04	.06	.03	.02	.11	.01	.02	.05
Content-centeredness of the teacher (B24)	.55	.46	.37	.35	.41	.49	.31	.42	.54
Share of indirect teacher influence (E1)	.37	.35	.37	.37	.39	.45	.29	.37	.46
Flexibility of the teacher (F, scale 0 to 2)	1.22	.79	.90	2.00	1.70	1.90		1)	
Share of T moves with social-aff. properties out of total number of T moves (D2)	.06	.04	.11	.04	.04	.06	.03	.05	.07
Share of pos. T moves out of total number of moves with social-aff. properties (D3)	.19	.52	.31	.62	.57	.61	.25	.48	.71
Spontaneity of pupils (B13)	.45	.30	.56	.42	.34	.53	.27	.42	.56
Goal-related behavior of pupils (H1, scale 0 to 2)	1.64	1.41	1.44	1.57	1.73	1.69		2)	
Share of PP sequences out of all sequences (G2)	.07	.05	.10	.17	.12	.16	.05	.09	.18
Content-centeredness of the pupils (B24)	.90	.75	.69	.81	.89	.71	.72	.84	.91
Share of personal experiences in pupils' communication (B22)	.02	.02	.00	.01	.02	.05	.01	.03	.11
Share of P moves with social-aff. properties out of total number of P moves (D2)	.05	.05	.14	.05	.05	.05	.03	.05	.08
Share of pos. P moves out of total number of moves with social-aff. properties (D3)	.48	.45	.15	.26	.62	.76	.11	.38	.75
Tension release (D6)	.41	.74	.19	.50	.77	.87	.29	.67	1.00

1) M = 1.56 2) M = 1.56

Class means of the variables generally vary very little compared with considerable variation among single lessons. In some cases, however, great and also understandable differences appear. Social-affective moves in Class 500 are relatively frequent on the part of both the teacher and the pupils, and clearly more negative than in other classes. The high figure of pupil spontaneity is in agreement with these facts. Several pupils in this class showed rather irregular behavior and the teacher had difficulty in mastering them (cf. his low figure in flexibility). Some discrepancies in the emotional area appear. Thus, in Class 300 pupils' positive moves were clearly more frequent than the teacher's, but in Class 400 the situation was reversed. The explanation may be found by scrutiny of teacher characteristics (cf. section 6.5.).

On the whole, Table 4 offers food for thought. Logical level of verbal communication is very low throughout, which indicates that the faculties of the eleven-year-old pupils have not been used in an adequate way. Share of social-affective moves indicates "an affectional desert" as FLANDERS has put it (1963). Teacher domination in the total number of moves is also apparent, as is the greater content-centeredness of the pupils in comparison with the teacher.

Classes 400, 200 and 800 in which the use of activity forms was the most diversified and pupil-centered, differ from the rest of the classes in some interesting areas: flexibility of the teacher, share of positive moves, and the amount of tension release. In the last-mentioned respect as well as in the share of indirect teacher influence, Class 800 differs from all the other classes. This is explained by the small number of pupils in this class and also by teacher characteristics (cf. 6.5.).

6.3. Activity Forms and Content Areas vs. Other Process Variables

Lessons belonging to activity form type P2 (pupil performances dominate) differ from other types in several process variables (Table 5).

Table 5. Characteristics of Instructional Processes During Lessons Representing Activity Form and Content

Index and its code in the OPA Helsinki Manual	Lessons representing activity form type				Lessons according to their main content area			
	T1	T2	T3	P2	MC	KR	FS	vS
Share of T moves out of total number of moves (B12)	.61	.61	.56	.51	.53	.58	.61	.52
Logical level of moves (B23)	.06	.03	.04	.11	.11	.02	.03	.07
Content-centeredness of the teacher (B24)	.55	.49	.38	.37	.42	.48	.35	.37
Share of indirect teacher influence (E1)	.36	.38	.37	.43	.47	.36	.27	.41
Flexibility of the teacher (F, scale 0 to 2)	1.3	1.2	1.4	1.9	1.5	1.6	1.2	1.5
Share of T moves with social-aff. properties out of total number of T moves (D2)	.07	.05	.06	.06	.08	.05	.06	.05
Share of pos. T moves out of total number of moves with social-aff. properties (D3)	.49	.41	.49	.61	.56	.45	.53	.55
Spontaneity of pupils (B13)	.53	.38	.40	.44	.47	.43	.31	.44
Share of PP sequences out of all sequences (G2)	.08	.06	.13	.16	.14	.10	.08	.16
Content-centeredness of the pupils (B24)	.80	.82	.78	.79	.80	.85	.79	.76
Share of personal experiences in pupils' communication (B22)	.03	.02	.02	.03	.02	.02	.01	.03
Share of P moves with social-aff. properties out of total number of P moves (D2)	.08	.05	.06	.06	.08	.05	.06	.06
Share of pos. P moves out of total number of moves with social-aff. properties (D3)	.70	.42	.31	.68	.53	.51	.28	.37
Tension release (D6)	.76	.53	.60	.81	.71	.62	.55	.59

Some of these differences are, however, technical (e.g., G2, E1) and are not discussed here. During P2 type lessons the share of positive emotional moves (teacher and pupils) was higher, the teacher more flexible, and tension release clearer. Surprisingly, even logical level of communication was higher. One could be tempted to conclude that this is connected with the teacher's more indirect influence (cf. lesson types T2 and T3 with direct leadership of the teacher and lower figures in B23).

There are not many differences between other lesson types. The high figure obtained for positive pupil moves (not the teacher's) in type T1 may be mentioned, and the fairly high figure for tension release. Have these characteristics a better chance to develop both when the teacher plays an "independent" role and mainly presents matters, and when she/he is withdrawn during pupils' own activities?

Differences mentioned above are on the whole meaningful. However, the question presents itself whether they are created by the properties of the lesson type or by characteristics of the teacher or by both. Table 1 shows that type P2 is represented in those classes only in which high figures in discriminating variables appear (cf. also Table 4). These figures and the occurrence of type P2 are consequently intertwined, and no definite explanation of connections between this lesson type and certain other process variables can be offered.

The same conclusion may be drawn in the case of type T2. This type seems to be connected with low logical level of communication, but this is partly due to the fact that T2 is overrepresented in Class 600 in which logical communication level in general was low. - Other lesson types show no clear connection with process variables. The question of relations between lesson type and concomitant process properties therefore remains open. It is possible that such connections simply result from the teacher's way of using activity forms.

Connections between <u>lesson contents</u> and other process variables are fewer and also less complicated (Table 5). Les-

sons with FS content (Mathematics) differ from all other lessons in several respects: the teacher was less flexible, pupils (but not the teacher) less spontaneous and emotionally less positive and, surprisingly, the logical level of communication was low. The last-mentioned trait also appears in KR lessons which, however, was to be expected.

Abstract thinking required and aimed at in Mathematics and direct teacher influence (the most common but not the only way) agree with those findings. From curricular point of view the logical level of communication is of interest, because textbooks used in the participating classes are based on the "New Mathematics" approach in which logical thinking is stressed much more than in older textbooks.

Distribution of contents among classes (Table 2) do not throw doubt upon conclusions above. FS contents are absent in Class 800 in which figures for logical level and flexibility were high, and in Class 300, in which they were low. There is no reason to believe that Class 600, in which FS lessons were overrepresented and figures for flexibility and spontaneity low, has affected the general trend mentioned above.

In conclusion, connections between lesson content and other process variables appeared in Mathematics only. Other trends are too weak to be given consideration.

Aspect C, however, comprises not only the content of instruction as such but also its relevance for pupils. In order to control the above statements, connections were investigated also from the view of the relevance of contents (Table 6). It may be noted that novelty and attractiveness do not correlate with each other ($r = -.10$, n.s.).

To ensure natural settings for observation the participating teachers were, as has already been mentioned, allowed to have a say in the selection of lessons to be recorded. This, and the fact that recordings were not carried out simultaneously in all classes, resulted in an uneven distribution of content areas in the classes. Scores indicating

Table 6. Relevance of the Content and Other Characteristics of the Instructional Process

Index and its code in the DPA Helsinki Manual	Novelty of the content			Attractiveness of the content		
	0	1	2	0	1	2
Share of T moves out of total number of moves (B12)	.55	.58	.61	-	.58	.55
Logical level of moves (B23)	.03	.06	.04	-	.04	.06
Content-centeredness of the teacher (B24)	.38	.43	.40	-	.43	.41
Share of indirect teacher influence (E1)	.36	.39	.39	-	.37	.42
Share of T moves with social-aff. properties out of total number of T moves (D2)	.07	.05	.08	-	.06	.06
Share of pos. T moves out of total number of moves with social-aff. properties (D3)	.56	.45	.47	-	.48	.53
Spontaneity of pupils (B13)	.42	.42	.41	-	.48	.53
Share of PP sequences out of all sequences (G2)	.14	.13	.07	-	.10	.13
Content-centeredness of the pupils (B24)	.75	.83	.77	-	.78	.81
Share of P moves with social-aff. properties out of total number of P moves (D2)	.07	.05	.05	-	.06	.06
Share of pos. P moves out of total number of moves with social-aff. properties (D3)	.41	.51	.37	-	.40	.56
Tension release	.59	.63	.61	-	.58	.79

relevance of content for pupils also differ to some extent. This is to be expected because the teacher may, in an observational situation, be tempted to choose contents attractive to pupils and contents to some extent familiar to them.

As to attractiveness, such a trend was in fact discernible but there were no clear differences between teachers. Conversely, novelty scores differ greatly in various classes. Teacher 6 has preferred quite new contents, while in Class 400 score 2 did not appear at all, neither did score 0 appear in Class 300. These extremes act as counterbalances to each other in the statistics set up for comparing relevance of content and other properties of the instructional process.

Contrary to what could be expected, different levels of content relevance do not discriminate among scores of concomitant process variables. Although numbers are small one could expect greater differences between lessons with quite new vs. quite familiar contents, or between the most attractive and moderately attractive contents. In general differences are small, even smaller than those between lessons belonging to various content areas.

There are some plausible explanations of this phenomenon. In Table 6 various content areas have been combined, and it is possible that relevance for the pupils functions differently within different content areas. In order to examine if this is so figures indicating relevance have been split up according to various contents. Owing to the very small numbers, this was not possible in all areas. The results are presented in Tables i and ii (Appendix 2).

On the other hand, it is also possible that ratings of the relevance are not completely valid. This alternative explanation can, of course, shown to be false if scrutiny reveals some logics in the relationships between relevance and content.

It can be expected that quite <u>new contents</u>, which in general are not the most attractive ones, produce more teacher moves than other contents which are more or less familiar to the pupils. Such a trend does appear generally

and particularly within content areas MC, KR, and FS. There is, however, no indication that the share of indirect teacher influence is following FLANDERS' rule (1963), i.e., the teacher should prefer indirect influence as long as learning goals are unclear for pupils. Share of positive teacher moves is, as expected, in general highest when contents are quite familiar, but this is clearly seen in KR contents only, and the situation is reversed in the FS area.

Pupils' spontaneity does not, as a rule, seem to be connected with novelty of the content. However, in different content areas the situation varies: during MC and FS lessons with familiar topics pupils are the most spontaneous, but during KR lessons novelty produces the highest spontaneity. This is explainable because novelty in the two first cases means that pupils do not have the necessary skill to manipulate the new matters, whereas they have this capacity in the latter case.

In other respects trends consequent upon concomitant process properties do not appear. The question as to what extent this is due to the qualities of different content areas must be left to future analyses when more comprehensive materials are available. In the present study analysis of ratings of novelty in connection with the scrutiny of relations between content and other process variables adds very little information to the explanation of characteristics of the instructional process during lessons grouped according to their content (Table 5).

As is evident from Table 6, scrutiny of the ratings of attractiveness does not shed much light on the question of relevance, probably on account of the quality of the ratings. New insight into differences belonging to various content areas is also rare in this case.

During MC and VS lessons teachers seem to prefer more indirect influence, which has a weak connection with attractiveness scores. Connections within these two areas are, however, reversed: only during VS lessons do the most attrac-

tive contents and amount of teacher's indirect influence go hand in hand. A possible explanation is that attractiveness produces so much spontaneity during MC lessons, in comparison with the situation in the V3 area, that more direct influence on the part of the teacher is needed, which is not the case when value problems are handled.

Share of positive pupil moves seems, as expected, to have connection with the level of attractiveness. As to tension release, figures for different content areas are not consistent. - In other respects trends shown in Table 6 also appear in different content areas.

6.4. Expectations Regarding Inter-process Connections

It was expected 1° that many-sided use of activity forms in a class correlates with high scores of cohesion. The participating classes were ranked according to the use of activity forms (frequencies of main categories). As a measure of cohesion the sum of rank numbers within variables D3 and D6 (combined), E1, G2, and H1 is used (cf. p. 3 and Appendix 1).

	Class					
	300	600	500	400	200	800
Distribution (%) of TC - PC - CO	93-5-2	89-11-0	75-25-0	79-14-7	47-51-2	36-59-5
Cohesion	21	24	25	17	10	7

Expectation 1° seems to be justified.

It was expected 2° that many-sided use of activity forms during a lesson correlates negatively with predominance of abstract and authority-bounded contents. During a lesson one, two or three main categories of activity forms (TC, PC CO) can occur. A lesson during which only one category was used was classified as one-sided (x), a lesson devoted to two main categories of activity forms was marked xx, and when all three categories were present the lesson was classified as many-sided (xxx). The lesson of types x to xxx were distributed among different content areas as follows.

Table 7. Many-sidedness vs. the Content of Lesson

Use of main categories of activity forms	Content areas MC	KR	FS	VS	MS	Total number of lessons
x	6	16	8	6	2	38
xx	6	7	2	2	-	17
xxx	1	4	-	-	-	5

It is not surprising that four-fifths of Mathematics lessons are uniform as to the use of activity forms, but rather unexpectedly the situation during lessons with content areas VS (three-fourths) and KR (two-thirds) is nearby similar. In the KR area, explanation is to be found in the fact that exercise books commonly used in Religion, Environmental & Social studies, and Geography are constructed in rather abstract terms and are composed of ready-made, also multiple-choice answers for pupils. A frequent use of such exercise books, which result in high frequency of category T_3 (joint exercise as a dominating activity form) as seen in Table 1, has evidently been a rather weak surrogate for live discussion, which could have been built on pupils' experiences and opinions. In Class 800, where use of such exercise books was very limited and T_3 lessons also rare, only half of lessons belonged to category x.

Expectation 2^{o} consequently seems justified. However, it should be added that the desirability of many-sidedness of a single lesson is over-emphasized. It is instead reasonable to advocate that during a longer period (e.g., a week) pupils be given opportunity to experience structurally different instructional situations, teacher and pupil centered and cooperative (PETERSEN 1950, 124). Such an arrangement was meant by the term "balance of instructional situations" (KOSKENNIEMI 1957). This request is fulfilled even when the use of activity forms in some content areas or during some lessons is one-sided, but of course not when one main category of activity

forms is completely absent during a week and the third category very rare. Such a state of affairs was observed in some of our participating classes.

It was expected 3° that many-sided use of activity forms in a class correlates with high scores of teacher's flexibility. F ratings (cf. Table 3) follow the rank order applying to manifold use of activity forms (cf. Table 1 and p. 18) rather closely, and expectation 3°can be regarded as justified.

6.5. Expectations Regarding Activity Forms vs. Frame Variables

Among the frame variables only teacher characteristics are dealt with in this paper. Differences between the teachers in age, experience and education were small and the teachers had, moreover, been educated at the same teacher training institution with one exception.

It was expected 4° that one-sided use of activity forms and low scores of cohesion correlate with teacher's inability or unwillingness to understand pupils as individuals and groups, as well as with difficulties in shaping didactical interaction during planning. In the examination of the first part of this expectation use will be made of psychometric data mentioned on p. 12 and teachers' statements about their educational aims expressed during interviews. The latter part of the expectation will be examined on the basis of the teacher's descriptions of their planning practice elicited during the interviews.

Results of personality tests used are, at least partly, incommensurable. Therefore, no attempt has been made to construct some kinds of teacher portraits or profiles on this basis. Instead, scales or factors which can be assumed to reflect prerequisites for pupil understanding have been selected among those instruments, and high vs. low scores have been then used for illustrating the area in question. The choice of ten measures presented in Table 8 was accordingly made on theoretical basis.

In this connection it is, of course, not assumed that relationships between selected personality variables and capacity to understand pupils are linear ones. Presumably there are optimal values which correspond with the greatest amount of understanding and which, in several cases, do not coincide with the highest vs. lowest ones. Within the present material, however, the frame for highest vs. lowest values is restricted to our six teachers, because there are no norms available for these measures. On account of the homogeneity of the background and training there is no reason to assume that the participating teachers would represent extremes of psychometric characteristics in general among teachers.

Table 8. Psychometric Measures of the Teacher Indicating Understanding of Pupils (+ high, - low value)

Measure	Teacher 3	6	5	4	2	8
TPS Factors						
- Affection seeking				+	-	
- Vicarious youth	+		-	+	+	+
EPPS Needs						
- Affiliation			-		+	+
- Nurturance			-		+	+
- Succorance			-	-		+
- Aggression[1]		-		+	+	
10 PF Traits						
- Extraversion	-				+	
- Manifest anxiety[1]		-	+			
- Impulsiveness[1]	-					+
- Dominance[1]	+		-			+
Positive items	2	-	1	3	5	6
Negative items	2	2	5	1	1	-

[1] Reversed

When connections between teacher personality and process variables are examined it should be kept in mind that the old proverb qualis rex talis grex holds some truth even in its reversed form. Although the participating classes had been under the guidance of their present teachersfor nearly two years, it is reasonable to give consideration also to the pupils. Some data from pupils' home environments and the most typical personality traits which characterize the class as a whole are therefore presented below in order to make it possible to check if possible teacher-process connections are understandable if the pupils are considered as a group.

Class 300 Frequent use of rewards in pupils' homes. School motivation and achievement motivation low, as well as timidity scores. A few disturbed pupils.

Class 600 Infrequent use of punishments in homes where the level of aspiration on average low. Pupils' school motivation and self-esteem rather low, sociability above average.

Class 500 Relatively many homes belong to lower social strata, their climate is not warm and they have only few intellectual interests. Share of conscientious and motivated pupils, mostly girls, is considerable but there are also many disturbed pupils. Sexes differ from each other: girls industrious and submissive. many boys original and without responsibility.

Class 400 Relatively great part of the homes belong to upper social strata. Their environment with rich intellectual interests is stimulating. Both punishments and rewards in use. Pupils characterized by low timidity and high self-esteem.

Class 200 School matters play a notable role in parent-pupil relationships. Frequency of punishments high, also school motivation. Number of intellectual interests among pupils above average, also share of conforming pupils and those with low sociability.

Class 800 Physical environments of the homes stimulative to a lesser extent but the climate warm. Frequent use of rewards. School motivation of the pupils below average, also low timidity and self-esteem scores.

Differences between the six classes are in general relatively small. Only Class 500 can, from the teacher's point of view, be considered difficult. In this case pupils' properties, as a frame factor, influence in same direction as

weaknesses in the teacher's personality. Pupils' properties in Class 400 and, to some extent in Class 300, may, on the other hand, be classified as a rather positive frame factor which perhaps serves to compensate teacher's influence.

It is to be expected that teachers who are asked to express their educational aims easily draw on statements in textbooks and curricular guides. The choice of what is said and what omitted during a personal interview will, however, be informative of the personality of the teacher. Although the material does not allow a thematic analysis teachers' statements were grouped as follows:

Certain capacities generally to be required

Teacher 3: useful knowledge and positive attitude

Social adaptation in general

Teacher 6: living according to norms, knowledge and skills which are useful in the community

Teacher 5: adaptation to circumstances in society

Teacher 4: adaptation to circumstances in life

Individual faculties and happiness

Teacher 2: happy individuals capable of using their faculties

Teacher 8: individuals in harmony with themselves and with their environment, and capable of leading a happy life.

To what extent, then, do teachers' personality data and their views on educational aims (as frames for the instruction), on the one hand, and their use of activity forms and measures of cohesion (as aspects of the process), on the other, coincide?

Such a comparison may appear to be questionable. Firstly, measures of process and measures which concern the teacher are not independent. The teacher is a major factor determining the use of activity forms, and teacher's influence on measures of cohesion is also considerable. Interaction cannot, however, be described if the teacher is excluded and, therefore, a comparison between measures, on the one hand, representing a whole and, on the other hand, one of its factors must be accepted as the only practical solution.

Secondly, measures of cohesion are presented as mean values over different situations in which cohesive behavior within the class does not have the same functions. According to the definition on p. 3, cohesion is seen as a principal force in the instructional interaction, present in all its situations. Even if its importance varies, it cannot be assumed to be non-existent.

In order to avoid scalar complications only rank orders were used in the comparisons in Table 9 below.

Table 9. Teacher Traits Indicating Understanding of Pupils and Some Process Variables

	Measure	Teacher 3	6	5	4	2	8
Process	Many-sided use of activity forms (cf. Table 1)	6	5	4	3	2	1
	Scores of cohesion (cf. Appendix 1)	4	6	5	3	2	1
Teacher	Personality traits assumed to correspond with understanding of pupils (Table 8)	4	5	6	3	2	1
	Individualistic aims for education	6	4	4	4	2	1

The first part of expectation 4° seems to be justified. Even if there are minor deviations from the general trend, measures of many-sided use of activity and cohesion correlate fairly well with measures indicating understanding of pupils and with individual aspects within educational aims. A more detailed investigation is needed to clarify whether exceptions are due to the teachers' personality structure as a whole or to their educational philosophy or both.

The material obtained in teacher interviews is insufficient for a detailed examination of the latter part of expectation 4°, because discussions about planning were

focused on rather formal matters (e.g., regularity, intervals, contents, etc.) and shaping of didactical interaction proper was not specifically touched upon.

Thus, the below descriptions of the teachers' planning practice do not shed enough light on the problem at hand. It seems, however, that Teacher 2 and 8 have taken didactical interaction into account to a greater extent than others.

Teacher 3 Teaching is conducted according to textbooks and by using teacher's guides without personal and regular planning.

Teacher 6 Textbooks and teacher's guides dominate in planning wich mostly concerns pet subjects.

Teacher 5 Planning is restricted to longer periods only.

Teacher 4 Planning is focused on the activities of the very next day and much is left to be solved on the spot.

Teacher 2 Planning proceeds on various levels (longer periods, weeks, days) and both situational and thematic factors are taken into account.

Teacher 8 Planning covers weeks and often single lessons and is focused on things not mentioned in textbooks or teacher's guides.

The latter part of expectation 4^{o} cannot, in the absence of relevant material, be properly examined. Weaknesses in leadership of the didactical interaction may or may not be connected with the quality of planning.

7. Summary and Discussion

Material which was collected by the DPA Helsinki research team and which consists of 60 lessons from six 4th grade classes was used in this paper to examine, firstly, to what extent instructional processes during lessons belonging to different activity form or content types differ from each other in relation to other properties of the process. No experimental design was used. Variance for use of activity forms, which naturally can be much more influenced by teachers than the choice of contents, proved to be rather great.

It was found, as expected, that many-sided use of activity forms in a class correlates with cohesion of the instructional process, cohesion being defined as a higher-level variable composed of measures of emotional climate, authority relationships, pupil participation and their goal-related behavior, and also with teacher flexibility.

Some additional findings may be mentioned. In general, logical level of communication and share of social-affective moves appeared to be rather low, domination of teacher moves great, and pupils' moves more content-centered than teachers'. Only activity form type P2 (pupil performance dominating) and T1 (teacher presentation dominating) differed clearly from other types as to concomitant properties of the process at large. In the former case share of positive teacher and pupil social-affective moves was high, as were tension release and logical level of communication, in the latter case share of positive pupil moves and tension release appeared to be high. This finding may not be so controversial as it seems; in both cases pupils reacted as individuals, not bound by the social context.

On the other hand, examination of how content of the instructional process correlates with other properties of this process showed, as expected, that predominance of abstract and authority-bounded contents was negatively connected with many-sided use of activity forms in a class. This was clearly the case in FS (i.e., Mathematics) lessons which in some respects differ from all other lessons. But this appeared to be true also of those KR (knowledge of reality) lessons where use of exercise books was frequent, these books being rather abstract as to their language and containing multiple-choice tasks instead of tasks which could be solved in an individual way.

As it seemed possible that the main factor connected with concomitant effects in other process variables could be the relevance of content for pupils and not content itself, novelty and attractiveness of the content were com-

pared with other process variables. Owing to the limited material this examination did not give much information. These attributes of the content seem, however, to play a different role within contents aimed at acquiring skills than within contents planned to increase knowledge.

The second aim of this investigation was to examine to what extent differences within the instructional process are connected with certain frame variables, especially the teacher. For this purpose a comparison was made between, on the one hand, process properties and, on the other hand, teachers' personality characteristics, their views on educational goals, and their practices in planning teaching. As expected, many-sided use of activity forms and cohesion of the instructional process were found to be rather closely connected with teacher characteristics supposed to indicate inability or unwillingness to understand pupils and with presence of individualistic views of educational goals. As to difficulties to shape didactical interaction during planning, the findings, contrary to expectation, are not conclusive.

To summarize in a few words it can be stated that the following trends appear in the results, with the qualification however, that the number of classes was small and that special arrangements (exercises in joint planning) may have affected results. Use of activity forms in the classes varied considerably despite the fact that the teachers' age, competence and experience, pupils' age and their other traits, curricular contents and school environments were similar. The way of using activity forms appeared to covary with most other properties of the instructional process, except with the content of instruction.

Thus, explanation for the covariance mentioned above was to be sought in personality traits of teachers, their educational aims and planning practice. Results led to the conclusion that there seemingly is a close connection between process properties (except the content) and teacher's

personality, i.e., as regards to traits which can be supposed to indicate understanding of pupils. Same connection was found regarding teachers' opinions on educational aims. Individualistic aims and higher values in above-mentioned personality traits correlated with many-sided use of activity forms and higher scores in cohesion.

Such authorities as KILPATRICK and PETERSEN have emphasized that the way instruction is carried out (i.e., its forms) is of greater importance than contents of the instruction (i.e., subject-matter) when harmonius development of pupil personality is the aim of school education. Results presented in this paper support rather than contradict this belief.

But if there is a connection between certain personality traits of the teacher and instructional interaction which creates possibilities for development towards the stated aims, what is the cause and what the effect? Teachers operate, of course, not only on the basis of their personality structure but also on the basis of their experience (vocational education included) and in accordance with the educational aims they have adopted. To what extent, then, can instructional interaction be improved by means of pre- and in-service education of teachers? Is it possible to help teachers to change their behavior?

This is not a proper place to take up such questions. I would, however, like to draw attention to the fact that once again an investigation into the structure and dynamics of the instructional process has brought us to the problems on teacher personality and education of teachers.

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Some Empirical Data on Cohesion

Cohesive instructional process presupposes high scores in following items (codes refer to the DPA Helsinki Manual 1974).

Climate of the classroom:

- Share of positive moves out of all emotional moves (D3)
- Tension release (D6)

Authority relationships:

- Share of teacher's indirect influence (E1)

Pupils' participation:

- Share of pupil-pupil sequences out of all sequences (G2)

Goal-related behavior:

- Goal-relatedness as expressed by pupils on a scale 0 to 2 (clearness, pleasantness, consciousness) (H1)

Following figures were obtained in our material (six classes, 60 lessons, H1 measured thrice a week):

Code	Class 300	600	500	400	200	800
D3, teacher	.19	.52	.31	.62	.57	.61
pupils	.48	.45	.15	.26	.62	.76
D6	.41	.74	.19	.50	.77	.87
E1	.37	.35	.37	.37	.39	.45
G2	.07	.05	.10	.17	.12	.16
H1	1.64	1.41	1.44	1.57	1.73	1.69

Rank correlations between aspects (D3 and D6 combined):

	D	E	G
H	.47	.87	.40
G	.20	.50	
E	.59		

Appendix 2

Table i. Novelty of the Content and Other Characteristics of the Instructional Process: Different Content Areas

Index	Content areas and novelty of the content								
	MC			KR			FS		
	0	1	2	0	1	2	0	1	2
B12	.54	.47	.57	.56	.57	.60	.57	.63	.66
B23	.03	.28	.08	.00	.02	.03	.03	.01	.02
B24, T	.61	.40	.45	.42	.46	.56	.34	.44	.32
E1	.46	.54	.45	.34	.35	.42	.27	.30	.24
D2, T	.08	.08	.08	.04	.04	.07	.07	.03	.06
D3, T	.50	.80	.47	.70	.42	.42	.44	.75	.60
B13	.52	.45	.40	.32	.41	.48	.41	.25	.18
G2	.14	.22	.10	.11	.11	.06	.12	.06	.02
B24, P	.80	.70	.86	.89	.86	.81	.62	.84	.64
B22	.00	.03	.01	.00	.03	.04	.01	.01	.00
D2, P	.10	.08	.07	.01	.04	.08	.08	.05	.03
D3, P	.46	.83	.43	.33	.54	.52	.30	.50	.00
D6	.60	.99	.61	-	.60	.58	.44	.50	.86

Table ii. Attractiveness of the Content and Other Characteristics of the Instructional Process: Different Content Areas

Index	Content areas and attractiveness of the content					
	MC		KR		VS	
	1	2	1	2	1	2
B12	.49	.57	.60	.57	.56	.49
B23	.15	.08	.02	.02	.04	.10
B24, T	.44	.41	.51	.46	.43	.31
E1	.55	.43	.36	.37	.29	.52
D2, T	.07	.09	.05	.04	.04	.06
D3, T	.68	.55	.39	.58	.45	.39
B13	.51	.57	.45	.35	.37	.51
G2	.19	.11	.09	.12	.13	.19
B24, P	.83	.76	.86	.87	.78	.73
B22	.01	.02	.02	.03	.01	.05
D2, P	.09	.08	.05	.05	.08	.05
D3, P	.50	.61	.50	.59	.36	.38
D6	.82	.72	.69	.40	.39	.79

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